

1. Report Security Classification: UNCLASSIFIED			
2. Security Classification Authority:			
3. Declassification/Downgrading Schedule:			
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT			
6. Office Symbol: C	7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207		
8. Title (Include Security Classification): The Geographic CINCs and Joint Interoperability: Overcoming the Responsibility/Authority Disconnect (U)			
9. Personal Authors: Jeffrey S. Carusone Major/USMC			
10. Type of Report: Final	11. Date of Report: 04 Feb 02		
12. Page Count: 23	12a. Advisor: COL Murray, USAF		
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.			
14. Ten key words that relate to your paper: Interoperability, Goldwater-Nichols Act, Goldwater-Nichols DOD Reorganization Act of 1986, Joint Interoperability, CINC, Combatant Commanders, CINC Responsibilities, CINC Authority, Interoperability Solutions, CINC Goldwater-Nichols Act Implementation			
15. Abstract: The geographic CINCs currently lack sufficient levels of joint interoperability to effectively prosecute military actions. In recent conflicts, the U.S. has been fortunate enough to succeed in battle because the enemy was militarily incompetent or use of overwhelming force was able to overcome joint interoperability deficiencies. Multiple government documents over the last three decades have laid the responsibility for interoperability on the CINCs without also giving them the authority to obtain it. Given this position, the CINCs need to take the following actions to increase joint interoperability: 1) Maintain strict documentation of existing interoperability problems to pressure those who have the authority to make improvements; 2) dictate strict interoperability requirements for forces earmarked for deployment to their AOR; 3) lobby for the creation of a discretionary fund for the establishment of detachments capable of easing interoperability difficulties; and 4) incite action by raising awareness at the highest political and military levels.			
16. Distribution / Availability of Abstract:	Unclassified <input checked="" type="checkbox"/> X	Same As Rpt	DTIC Users
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841-6461	20. Office Symbol: C		

REPORT DOCUMENTATION PAGE

Security Classification of This Page: UNCLASSIFIED

NAVAL WAR COLLEGE
Newport, RI

**THE GEOGRAPHIC CINCS AND JOINT INTEROPERABILITY:
OVERCOMING THE RESPONSIBILITY/AUTHORITY DISCONNECT**

by

Jeffrey S Carusone
Major, United States Marine Corps

Submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: _____

4 February 2002

COL Charles Murray USAF -- Faculty Advisor

Report Documentation Page		
Report Date 04 Feb 2002	Report Type N/A	Dates Covered (from... to) - -
Title and Subtitle The Geographic CINCs and Joint Interoperability: Overcoming the Responsibility/Authority Disconnect		Contract Number
		Grant Number
		Program Element Number
Author(s)		Project Number
		Task Number
		Work Unit Number
Performing Organization Name(s) and Address(es) Joint Military Operations Department Naval War College 686 Cushing Road Newport, RI 02841-1207		Performing Organization Report Number
Sponsoring/Monitoring Agency Name(s) and Address(es)		Sponsor/Monitor's Acronym(s)
		Sponsor/Monitor's Report Number(s)
Distribution/Availability Statement Approved for public release, distribution unlimited		
Supplementary Notes		
<p>Abstract</p> <p>Joint interoperability is vital in order for the combatant commanders (CINCs) to effectively prosecute military actions. Numerous Department of Defense (DoD) documents, including the Goldwater-Nichols Act, have attempted to address the importance of interoperability and expedite its implementation through clear and specific directives. Unfortunately, the documentation has also created major hurdles for the geographic CINCs by giving them responsibility for improving joint interoperability without giving them the authority to do it. This situation has existed for decades and has hindered the CINCs ability to effectively fight as a joint force.¹ Because of this, it is clear that in order to effectively employ the joint force, the geographic CINCs must exert greater influence on joint interoperability. To this day, DoD is still attempting to increase joint interoperability through history of this problem, it is unlikely that new documents will have any greater effect than the previous ones. It is also unlikely that the disconnect between DoD responsibility and authority for joint interoperability will be overcome in the near future. Given this environment, it is critical that the CINCs take the situation into their own hands and use the authority that they do possess to influence and thereby increase joint interoperability. This paper offers four recommendations which the geographic CINCs can use to gain the necessary influence to dramatically improve joint interoperability.</p>		
Subject Terms		

Report Classification unclassified	Classification of this page unclassified
Classification of Abstract unclassified	Limitation of Abstract UU
Number of Pages 24	

Joint interoperability is vital in order for the combatant commanders (CINCs) to effectively prosecute military actions. Numerous Department of Defense (DoD) documents, including the Goldwater-Nichols Act, have attempted to address the importance of interoperability and expedite its implementation through clear and specific directives. Unfortunately, the documentation has also created major hurdles for the geographic CINCs by giving them responsibility for improving joint interoperability without giving them the authority to do it. This situation has existed for decades and has hindered the CINCs ability to effectively fight as a joint force.¹ Because of this, it is clear that in order to effectively employ the joint force, the geographic CINCs must exert greater influence on joint interoperability.

To this day, DoD is still attempting to increase joint interoperability through written documentation. Given the history of this problem, it is unlikely that new documents will have any greater effect than the previous ones. It is also unlikely that the disconnect between DoD responsibility and authority for joint interoperability will be overcome in the near future. Given this environment, it is critical that the CINCs take the situation into their own hands and use the authority that they do possess to influence and thereby increase joint interoperability. This paper offers four recommendations which the geographic CINCs can use to gain the necessary influence to dramatically improve joint interoperability.

JOINT INTEROPERABILITY-- RESPONSIBILITY / AUTHORITY DISCONNECT

Equipment interoperability is vital for the proper functioning of the joint force. In order for the CINC to adequately prosecute a campaign, he must “ensure

that (his) joint operations are integrated and synchronized in time, space and purpose....”² This means that the CINC must make certain his forces are enabled to execute coordinated action through the use of compatible equipment. Though the term "joint interoperability" is common, there is no definition for it in current joint publications. For the purposes of this paper, joint interoperability is defined as the ability to exchange information directly and satisfactorily between equipment in order for the joint forces to execute the commander's mission.³

Seemingly self-evident, interoperability is quite complex in execution. In the context of the U.S. military, joint interoperability continues to be one of the biggest challenges our armed forces face....⁴ The interoperability challenge ranges from the independent development of air refueling connectors⁵ to the more complex problem of incompatible command, control, communications, computers, and intelligence (C⁴I) systems aimed at integrating and networking the joint battlespace. Currently, U.S. military systems are largely stovepiped with little insurance that they would work in concert with their sister service equivalents.⁶ When forces arrive in theater with incompatible weapon and sensor systems, the CINC is clearly handicapped in his ability to command, control, and fight his joint force.

The CINC is responsible for ensuring maximum interoperability of his assigned forces; unfortunately, he lacks the requisite authority to adequately rectify the problem. The, *Unified Action Armed Forces* (UNAAF), the cornerstone document for joint operations, emphatically states that "commanders are responsible for ensuring the maximum level of interoperability"⁷ of their assigned forces. However,

the same document places the overall authority to implement joint interoperability with the Chairman of the Joint Chief of Staff (CJCS).⁸ As long as the governing documents of the armed forces continue to maintain this obvious disconnect, joint equipment interoperability will continue to be an artificial obstruction to success in joint battles. To ensure an interoperable joint force, the geographic CINCs must have greater influence on joint interoperability.

Some argue that joint interoperability is not a problem in the U.S. military. They contend that despite past problems with cross-service equipment compatibility, the modern U.S. fighting force is a completely integrated fighting machine. Successes in Operations DESERT STORM, NOBLE ANVIL, and ENDURING FREEDOM demonstrate the superior ability of the U.S. military to prosecute campaigns as a completely interoperable entity. Though this argument is compelling, closer analysis demonstrates its flaws.

Though the U.S. military has enjoyed successes, recent military actions have been prosecuted either against a militarily incompetent foe, such as Saddam Hussein, or with such overwhelming force that the handicaps incurred from lack of joint interoperability did not seriously effect the outcome. Nonetheless, the after action reports of these operations all identify significant joint interoperability issues that if left unattended could result in defeat or significant loss of life as the military reorganizes based on past victories.⁹ To avoid possible military disaster in future joint conflicts, significant advances must be made in implementing joint interoperability.

JOINT INTEROPERABILITY – LESSONS LEARNED

The recognition of a joint interoperability responsibility/authority disconnect is not new to the DoD. In fact, DoD has used doctrine as a means to educate, task and implement interoperability for decades.¹⁰ The effectiveness of this approach has met with mixed results, and on balance, DoD's history of implementing interoperability has been poor.¹¹ A more complete examination of the documentation that has guided joint interoperability and ensuing joint operations demonstrates the challenges associated with joint interoperability.

Vietnam Era

During the 1960's, the principal guidance for joint equipment interoperability was outlined in DoD's Interoperability Directive 4630.5. The directive established policy and procedures to ensure that command, control, and communications (C³) equipment interoperated across the joint force. As a matter of policy, the military departments were required to develop and procure equipment that was either compatible or common when fulfilling similar operational requirements. A further objective of the policy was to “minimize the addition of buffering, translative, or similar devices for the purpose of achieving workable connections.”¹²

The directive clearly delineated the responsibility and authority for joint interoperability. It stated that, the principal staff assistants to the Secretary of Defense (SECDEF) were required to implement the policy during budget and funding reviews. The service secretaries were directed to assure that a copy of each operational requirement was provided to, and coordinated with, the other services,

the CINCs, and the CJCS. The CJCS was tasked to describe the criteria and standards necessary to achieve compatibility among automated tactical communications and control systems in joint operations.¹³

However, despite the clear guidance provided by the *DoD Interoperability Directive*, problems with joint interoperability continued to plague the CINC. During a House Armed Services Committee hearing on close air support (CAS), it was revealed that Air Force pilots could not talk with ground forces in order to conduct coordination necessary to release ordnance. The Army and the Air Force had independently designed and fielded incompatible radios that operated in two different frequency bands -- an error that seriously degraded joint interoperability.¹⁴

From the example, it is clear that the services were not committed to realizing joint equipment interoperability. The result of these joint interoperability disconnects was additional planning requirements on the CINC and his service components, which necessarily diminished combat effectiveness. Because the individual services are not always putting the joint requirements first, the geographic CINCs must exert greater influence on interoperability in order to effectively employ the joint force.

Cold War Era

During the cold war the most significant document aimed at rectifying the problems with joint interoperability was the Goldwater-Nichols Department of Defense Reorganization Act of 1986 (GNA). In the early 80's, greater awareness among senior officers and the recent military failures of DESERT ONE, Beirut, and

Grenada, prompted Congress to reorganize the DoD through the passage of the GNA.¹⁵ The GNA was designed to implement several key articles that would require cooperation from service chiefs and delineate clear and authoritative command for the CINCs, resulting in significantly improved joint interoperability.

Congress listed twenty-six specific provisions they wanted GNA to accomplish, and of these, three specifically addressed issues impacting interoperability. First, the GNA required the CJCS to advise the SECDEF on the extent to which the program recommendations and budget proposals of the military departments would conform to priorities established by the CINCs. Second, the GNA sought to strengthen and expand the "full operational command" authority of CINCs. Finally, the GNA specified that the functions of the military departments to man, train, and equip must be undertaken to meet the operational requirements of the combatant commands.¹⁶ Clearly, Congress designed the GNA to grant more influence to the CINC on matters affecting joint interoperability.

The GNA received its first field test five years later when the United States found itself in a large-scale war requiring a large-scale deployment. Operation DESERT STORM proved to be a full test of joint interoperability. Though ultimately an overwhelming victory for the United States, DESERT STORM demonstrated serious problems with joint interoperability. First, air tasking order (ATO) development and dissemination was hampered by a lack of an integrated, automated system capable of reaching all coalition air forces. Second, stovepiped intelligence and command information systems, concentrated on supporting

national and theater commanders at the expense of providing timely, crucial information at the tactical level. Finally, a myriad of assorted and incompatible communications systems, specifically multi-channel and switched systems, single channel radio systems, and communication encryption incompatibilities were intensified by limited quantities of critical communications assets (i.e. satellite communications (SATCOM)) and cohesive procedures for spectrum management.¹⁷

Ultimately, the Central Command CINC, (General Norman Schwarzkopf) was able to overcome the interoperability problems that plagued his joint forces, but only through individual ingenuity and only after deployment. Though he was a joint force commander, he did not have the authority to properly integrate his force prior to hostilities. Thus while, theoretically solving the responsibility/authority disconnect, the GNA has had little practical effect on the problems of joint interoperability.

Post Cold War Era

In the post-Cold War era, the DoD has vigorously approached the challenge of joint interoperability. Most significantly, in 2000, the CJCS issued an instruction (CJCSI 6212.01B *Interoperability and Supportability of National Security Systems, and Information Technology Systems*) that established strict procedures for the command, control, communications, and computers (C4) Systems Directorate (J-6) to implement the verification of the interoperability requirements of information technology systems.¹⁸ The objective of this instruction is to codify the development of C4 systems that meet the essential needs of U.S. forces and are interoperable with

existing and proposed systems.¹⁹ Above all, systems that are built for US forces are for joint, combined, and coalition use.²⁰ The CJCS designated Joint Forces Command (JFCOM) as the "joint force integrator" to evaluate the sufficiency of interoperability from a CINC's perspective, using the universal joint task list and the joint mission-essential task list as tools.²¹ CJCSI 6212.01B includes explicit instructions on the handling of interoperability challenges facing the armed forces, and it tasks organizations with identifying and addressing interoperability problems.

Though the DoD has committed significant resources to examining problems of joint interoperability, it seems that little has changed to improve operational responsiveness. For example, the All Service Combat Identification Evaluation Team (ASCIET), established in 1994 to address shortfalls and concerns related to identifying entities on the battlefield, has concluded that joint interoperability remains less than optimal. ASCIET exercises, typically two weeks long and including over 5,000 joint force participants,²² demonstrate that many interoperability problems that existed during DESERT STORM still plague the joint force. Many ASCIET after action reports cite the inability of the joint force to effectively share a common air picture, the incompatibility of C4I systems and the difficulties in integrating legacy and new technologies as common difficulties in joint exercises. For example, ASCIET after action reports from 2000 state, there has been "no significant improvement in situational awareness and combat identification

in the ground combat arena since Desert Storm."²³ The report continues that,

"Interoperability shortfalls continue to plague the air defense community."²⁴

Current DoD publications are comprehensive and directive in addressing problems of joint interoperability, and, if DoD were able to adhere to the guidance outlined in these documents, interoperability would be drastically improved.

However, decades of directives, orders, instructions, and law have not changed the fact that we are not at the desired level of interoperability. In fact, some argue that interoperability is getting worse. The most startling trend is one that was identified by the current Deputy Director for Systems Interoperability in the Office of the Under Secretary of Defense. The Deputy Director stated that after action reports from the geographic CINCs are "replete with interoperability problems"²⁵, and that recent "exercise results have tended to show worsening interoperability."²⁶ There is no doubt that interoperability is still a major problem with our joint forces; joint exercises and operations indicate that we have made little improvement since the increased focus on interoperability starting in 1992.

Current Interoperability Efforts

The latest CJCS Instruction on interoperability designated United States Joint Forces Command as the primary joint force integrator.²⁷ Additionally, JFCOM is responsible for providing trained forces to the other CINCs while assuming a significant role in implementing JV 2010 and 2020.²⁸ There is no doubt that JFCOM is leading the pack on interoperability but, without control over service funding, the services will continue to modernize at their own pace working off of their individual

service prioritized list of acquisition programs.²⁹ Interoperability continues to be one of the biggest challenges the military faces primarily because the services continue to operate with legacy systems. As, General Bell (JFCOM, J-6) said, "If we are going to realize the vision of Joint Vision 2020, we have to do some things, and we have to start now."³⁰ Mr. Money who is the current Assistant Secretary of Defense (ASD) for command, control, communications, and intelligence (C3I) recently said, "each of the services has been developing its own systems aimed at networking the battlespace, but these systems largely have been stovepiped with little assurance that they will work in concert with their equivalents in other services."³¹

The most recent attempt by DoD to address the responsibility/authority disconnect in joint interoperability occurred on October 12, 2001. The Deputy SECDEF Memorandum on "Command and Control Legacy Interoperability Strategy and Milestone Action Plan" gave OSD, CJCS, CINCs, and the services until March 29, 2002 to complete specific actions which identify critical C2 shortfalls, identify opportunities for consolidation or elimination and develop measures to determine success in overcoming legacy C2 interoperability shortfalls.³² The goal for DoD is to have legacy systems with "critical command and control functions" interoperable by the end of fiscal year 2008.³³ Given the history of interoperability, there is no reason to believe that this document will provide any real relief for the CINCs.

It is certain that a lot of energy has been expended in order to improve interoperability. Although the Congress, CJCS, and services have all produced

orders and guidelines mandating joint interoperability, the CINCs continue to receive forces with incompatible equipment. Because of the continued disconnect between desires of joint interoperability and the reality of service-to-service incompatibility, it is clear that in order to ensure the deployment of an integrated joint force, the CINC must actively influence joint interoperability.

Some argue that the documents were not designed to solve the joint interoperability problems; they were designed to serve as overarching guidance. They point to the fact that the joint forces have been waging wars without the higher levels of joint interoperability called for by these documents and suggest a "do not fix it unless it is broken" policy.

The future concept of war fighting depends on increased joint interoperability. The CJCS says in Joint Vision 2020 that he "mandates"³⁴ the joint force of 2020 to be interoperable in the areas of communications and information sharing and further, he considered it "essential" in order to maximize the force in 2020.³⁵ Because of the future of war fighting requirements for the CINCs it is clear they must wield greater influence on implementing joint interoperability.

THE CINCS INTEROPERABILITY CHALLENGES

The preceding analysis paints a grim picture of the current state of joint interoperability. First, joint interoperability is not going to be eradicated without a fundamental cultural change within DoD that will ensure that the CINCs are provided with the necessary joint interoperable equipment for the completion of their missions. Examination shows that this cultural change will not happen

quickly; therefore, the CINC must take near-term actions to improve joint interoperability. The CINC is the best candidate to lead this change because he has the greatest interest in its success as the person responsible for the potential loss of lives that incompatibility could cause and because he knows the problems caused by failed interoperability on a firsthand basis.

Second, the interoperability problems facing the CINC require his immediate attention. The joint interoperability problem will grow more difficult as stovepiped systems continue to be added. The J-6 for the Joint Chiefs of Staff, Lieutenant General Kellogg commented recently that "interoperability remains the biggest challenge facing the services, as a new legacy system is born every day" and the joint task force concept "is a big scam" until interoperability problems are overcome.³⁶ In addition, by Lieutenant General Kellogg's count, more than 130 people in the U.S. Defense Department believe they are in charge of interoperability. Every system that is added before the CINC implements interoperability controls will make interoperability more difficult and more costly to attain.

Finally, the CINCs must be the principal force in proactively influencing operational interoperability. The CINCs have a unique ability to view and address interoperability problems because of their unique perspective.

RECOMMENDATIONS TO THE CINC

Though the challenges of joint interoperability are daunting, there are several immediate actions that the CINC should take in order to influence joint interoperability in his area of responsibility (AOR). First, the CINC must maintain

strict documentation of existing interoperability problems. The CINC and his service components sponsor numerous exercises each year that provide opportunities to expose interoperability problems. The opportunity to structure all or a part of these exercises to maximize the uncovering of interoperability issues would increase the awareness of the war fighters and create pressure within their respective services to develop and fund corrective actions. Documentation can also be used to gain and maintain "pressure" on the CJCS, who is currently responsible for joint interoperability, and provide documentation to the Joint Staff and the Joint Universal Lessons Learned (JULLS) database.

Second, the CINCs should dictate strict interoperability requirements for forces earmarked for deployment to their AOR. These established interoperability requirements would have three major benefits. They would provide the CINCs with increased interoperability, provide a proven interoperability standard to the DoD and joint staff, and provide a standard to assist in ranking interoperability problems. Interoperability will be increased through detailed specifications and expectations being known by component commanders before they arrive in theater. These specifications need to be detailed enough to be useful to the tactical units to assist in determining potential interoperability issues. In the past, CINCs have accomplished this with varying levels of detail and success;³⁷ however, doing this will provide the CINC with a force that is better prepared for combat upon arrival in theater. Also in doing this, the CINC could provide a proven interoperability standard to the Department of Defense Chief Information Officer, the Assistant SECDEF for C3I, in

order to facilitate the timely implementation of an effective architecture. The CINC, therefore, would establish his own interoperability standards, which outline C4I requirements that units need to comply with before they deploy to his theater. Of course, if all CINCs used the same standards, "global interoperability" would increase.

Third, the CINC should lobby for the creation of a discretionary fund for the establishment of detachments capable of easing interoperability difficulties. These detachments would be led by members of the CINCs' staff and representatives from the component commanders, but they would also have other interoperability personnel (i.e. Defense Information Systems Agency (DISA), Joint Staff (J-6), etc.) imbedded in the detachments as the issues they face will be extremely diverse and require access to all supporting agencies. In addition, the documented use of specific hardware and software used to increase interoperability will be beneficial for the first recommendation.

Finally, the CINC should incite action by raising awareness at the highest political and military levels. The leadership at the DoD and joint staff knows that to really effect interoperability cultural change is required. General Myers, Vice CJCS recently indicated that for the U.S. military to reach its interoperability goals a "far-ranging cultural change"³⁸ would be required. More specifically he went on to say "It will take a change of culture probably on the scale of the culture change that occurred when the [U.S.] Air Force became independent of the Army."³⁹

It is difficult to create cultural change in any institution; therefore, debate for

change must be public, be vigorous, and clearly demonstrate the critical shortcomings of the current state of joint interoperability. History shows that this tactic has been successful in the past as in the case of General David C. Jones who was on the joint staff for eight years, four as the Chairman. Starting his second term as the Chairman he started discussing his ideas for how to change the Joint Chiefs of Staff. He received no support from the Secretary of Defense, several of the service secretaries and most of the service chiefs. Regardless, he pursued his beliefs and wrote an article that was published in the Armed Forces Journal International in March 1982. This article was widely read by Congressmen and others, and as a result today we have the Department of Defense Reorganization Act of 1986.⁴⁰ We need to continue his efforts and continue to change for the better.

Great strides toward effective employment of the joint force would occur if the geographic CINCs were to implement these four recommendations: document interoperability discrepancies, establish regional interoperability standards, develop a discretionary fund for interoperability, and raise awareness at the highest levels of the government.

CLOSING

For years, the CINCs have had sufficient documented ability to effect positive change in joint interoperability. However, progress has not occurred because only a handful of people have been proactive and creative enough to make the system work towards this crucial goal of joint interoperability. General David C. Jones and his 1982 article are a great example. The recommendations outlined in this paper

follow in the same spirit and, if implemented, will eventually lead to the cultural change necessary for joint interoperability to stay in the forefront of future operations.

BIBLIOGRAPHY

- Ackerman, Robert K. "Jointness Defines Priorities for the Defense Department's Global Grid." Signal (April 2001): 23-27.
- _____. "Military Crystal Ball Portends Network-Centric Supremacy." Signal (June 2001): 16-19.
- Adkin, Mark, Urgent Fury, the Battle for Grenada. Lexington, MA: Lexington Books, 1989.
- All Service Combat Identification Evaluation Team. "ASCIET 2000 Quick Look(U)" Date Time Group Secret 271643Z APR 00. Eglin Air Force Base, FL: 27 April 2000.
- Allard, C. Kenneth, Command, Control, and the Common Defense. New Haven, CT: Yale University Press, 1990.
- Black, Michael B. "Coalition Command, Control, Communications, Computer, and Intelligence Systems Interoperability: A Necessity or Wishful Thinking?" Unpublished Research Paper, U.S. Army War College, Carlisle Barracks, PA: 2000.
- Burger, Kim. "General William Kernan - Commander-in-Chief, US Joint Forces Command and NATO Supreme Allied Commander, Atlantic" Jane's Defence Weekly, 29 (August 2001) 32.
- Chairman of the Joint Chiefs of Staff. Command, Control, Communications, Computers, and Information for the Warrior. Washington, DC: 1992.
- Chairman of the Joint Chiefs of Staff. Interoperability and Supportability of National Security Systems, and Information Technology Systems. CJCSI 6212.01B. Washington, DC: 8 May 2000.
- Chairman of the Joint Chiefs of Staff. Joint Vision 2010. Washington, DC: 1995.
- Chairman of the Joint Chiefs of Staff. Joint Vision 2020. Washington, DC: 2000.
- Crowe, Kenneth M. "Goldwater-Nichols Act: Time for Reform." Unpublished Research Paper, U.S. Army War College, Carlisle Barracks, PA: 2000.
- Douglas, Gordon and Tran, Phuong. "Joint Interoperability Certification." Program Manager (September-October 1999): 24-27.
- Fasulo, Robert J. "Joint Communications Interoperability." Unpublished Research Paper, U.S. Army War College, Carlisle Barracks, PA: 1996.
- "Interoperability Puzzle Can Be Solved." Signal (August 2001): 62-64.

Jones, David C. "Why the Joint Chiefs of Staff Must Change." Armed Forces Journal International (March 1982): 62-72.

Lawlor, Maryann. "Using Information Mandates A Military of One." Signal (April 2001): 19-21.

Lovelace, Douglas C., Unification of the United States Armed Forces. Carlisle Barracks, PA: U.S. Army War College. Strategic Studies Institute, 1996.

McKnight, Clarence E., ed. Control of Joint Forces. Fairfax, VA: AFCEA International Press, 1989.

McKnight, C. E., "Solving the Interoperability Problem." In Principles of Command and Control, edited by Jon L. Boyes and Stephen J. Andriole, 382-396. Washington: AFCEA, 1987.

Mundy, Carl E. "Cautions on Goldwater-Nichols." Joint Force Quarterly (Autumn 1996): 21.

National Defense University. The Joint Staff Officer's Guide. Norfolk, VA: 2000.

Reddy, Peter C. "Joint Interoperability: Fog or Lens for Joint Vision 2010?" Unpublished Research Paper, Air Command and Staff College, Maxwell Air Force Base, AL: 1997.

U.S. Congress, House of Representatives, Goldwater-Nichols Department of Defense Reorganization Act of 1986, Conference Report 99-824, 99th Congress, 2nd Session, 12 September 1986.

U.S. Congress, Senate, Department of Defense Reorganization Act of 1986, Conference Report 99-280, 99th Congress, 2nd Session, 14 April 1986.

U.S. Department of Defense. Interoperability and Supportability of Information Technology and National Security Systems. DOD Directive 4630.5. Washington, DC: 11 January 2002.

U.S. Deputy Secretary of Defense. Memorandum on Command and Control Legacy Interoperability Strategy and Milestone Action Plan. Washington, DC: 12 October 2001.

U.S. General Accounting Office. DOD's Efforts to Achieve Interoperability Among Tactical C3 Systems, Report to the Legislation and National Security Subcommittee Committee on Government Operations. Washington, DC: 1987.

U.S. General Accounting Office. DOD's Renewed Emphasis on Interoperability is Important but Not Adequate, Report to the Secretary of Defense. Washington, DC: 1994.

U.S. General Accounting Office. Weaknesses in DOD's Process for Certifying C4I Systems' Interoperability, Report to the Subcommittee on Military Research and Development. Washington, DC: 1998.

U.S. Joint Chiefs of Staff. Doctrine for Joint Operations. Joint Pub 3-0. Washington, DC: 10 September 2001.

U.S. Joint Chiefs of Staff. Joint Doctrine Encyclopedia. Washington, DC: 16 July 1997.

U.S. Joint Chiefs of Staff. Unified Action Armed Forces. Joint Pub 0-2. Washington, DC: 10 July 2001.

Walsh, Ed. "Common Command and Decision Battles for Systems Interoperability." Proceedings (May 2001): 186.

Walsh, Ed. "Interoperability-Coming Soon?." Proceedings (November 1998): 89.

West, Richard D. and Baucom, Donald R. "Joint Mission Acquisition - An Idea Whose Time Has Come." Program Manager (March-April 1999): 74-77.

Quinlan, Robin and Tillery, Gordon. "Enabling Information Superiority Through C4ISR Interoperability." Lkd. http://www.dodccrp.org/2000CCRTS/tracks/Track_3.htm [06 January 2002].

Quinn, Dennis J., ed. The Goldwater-Nichols DOD Reorganization Act: A Ten Year Retrospective. Washington, DC: National Defense University Press, 1999.

Zavin, Jack. Chief, Information Interoperability, Department of Defense Chief Information Officer. Telephone conversation with author, 16 January 2002.

ENDNOTES

¹ "Interoperability Puzzle Can Be Solved." Signal (August 2001): 64.

² Joint Chiefs of Staff. Doctrine for Joint Operations. Joint Pub 3-0. (Washington, DC: 10 September 2001), II-3.

³ Joint Chiefs of Staff. Joint Doctrine Encyclopedia. (Washington, DC: 16 July 1997), 352

⁴ Maryann Lawlor, "Using Information Mandates A Military of One." Signal (April 2001): 20.

⁵ Jack Zavin, Chief, Information Interoperability, Department of Defense Chief Information Officer, telephone conversation with author, 16 January 2002.

⁶ Robert K. Ackerman, "Jointness Defines Priorities for the Defense Department's Global Grid." Signal (April 2001): 24.

⁷ Joint Chiefs of Staff. Unified Action Armed Forces. Joint Pub 0-2. (Washington, DC: 10 July 2001), I-10.

⁸ Ibid.

⁹ Peter C. Reddy, "Joint Interoperability: Fog or Lens for Joint Vision 2010?" (Unpublished Research Paper, Air Command and Staff College, Maxwell Air Force Base, AL: 1997), 13

¹⁰ General Accounting Office. DOD's Efforts to Achieve Interoperability Among Tactical C3 Systems. Report to the Legislation and National Security Subcommittee Committee on Government Operations. (Washington, DC: 1987), 20-22.

¹¹ General Accounting Office. Weaknesses in DOD's Process for Certifying C4I Systems' Interoperability. Report to the Subcommittee on Military Research and Development. (Washington, DC: 1998), 2-3; General Accounting Office. DOD's Renewed Emphasis on Interoperability is Important but Not Adequate. Report to the Secretary of Defense. (Washington, DC: 1994), 3.

¹² General Accounting Office. DOD's Efforts to Achieve Interoperability Among Tactical C3 Systems, 21-22.

¹³ Ibid.

¹⁴ Ibid., 20.

¹⁵ Douglas C. Lovelace, Unification of the United States Armed Forces (Carlisle Barracks, PA: U.S. Army War College. Strategic Studies Institute, 1996), iii.

¹⁶ Congress, Senate, Department of Defense Reorganization Act of 1986, Conference Report 99-280, 99th Congress, 2nd Session, 14 April 1986, 3-4.

¹⁷ Reddy, 13.

¹⁸ Chairman of the Joint Chiefs of Staff. Interoperability and Supportability of National Security Systems, and Information Technology Systems, CJCSI 6212.01B. (Washington, DC: 8 May 2000), 1.

¹⁹ Ibid., 2.

²⁰ Ibid.

²¹ Ibid., A-3.

²² Reddy, 15.

²³ All Service Combat Identification Evaluation Team. "ASCIET 2000 Quick Look(U)," Date Time Group Secret 271643Z APR 00. Eglin Air Force Base, FL: 27 April 2000, 1-16.

²⁴ Ibid., 1-16

²⁵ Robin Quinlan and Gordon Tillery "Enabling Information Superiority Through C4ISR Interoperability." Lkd. http://www.dodccrp.org/2000CCRTS/tracks/Track_3.htm [06 January 2002] 4.

²⁶ Ibid., 9

²⁷ Chairman of the Joint Chiefs of Staff. Interoperability and Supportability of National Security Systems, and Information Technology Systems, CJCSI 6212.01B. (Washington, DC: 8 May 2000), A-3.

²⁸ Lawlor, 20

²⁹ Ibid.

³⁰ Ibid.

³¹ Ackerman, 24

³² Deputy Secretary of Defense. Memorandum on Command and Control Legacy Interoperability Strategy and Milestone Action Plan, (Washington, DC: 12 October 2001).2.

³³ Ibid.,1

³⁴ The word "mandate" is only used once in JV 2020 and it is used in describing the need for interoperability and the word "essential" is used six times with five of those being reserved for interoperability. It is obvious that the CJCS wanted to emphasize that interoperability will play a critical role in attaining JV 2020.

³⁵ Chairman of the Joint Chiefs of Staff. Joint Vision 2020. (Washington, DC: 2000), 15.

³⁶ "Interoperability Puzzle Can Be Solved," 64.

³⁷ Robert J. Fasulo "Joint Communications Interoperability," (Unpublished Research Paper, U.S. Army War College, Carlisle Barracks, PA: 1996), 11-14.

³⁸ "Interoperability Puzzle Can Be Solved," 64.

³⁹ Ibid.

⁴⁰ "Department of Defense Reorganization Act of 1986," 4.
